

**WHAT IS CLAIMED IS:**

1. An apparatus for measuring a value of a battery module voltage, the battery module being included in a modularized battery of an electric vehicle, the apparatus comprising:

5 a differential amplifier circuit for outputting a modified voltage difference, the differential amplifier having input terminals and at least one resistor, the modified voltage difference being obtained by modifying a voltage difference inputted through the input terminals on the basis of a gain according to the resistivity of the at least one resistor;

10 an auxiliary power source for outputting a reference voltage;

a first switching circuit for controlling applying of the battery module voltage to the input terminals;

a second switching circuit for controlling applying of the auxiliary power source to the input terminals; and

15 a controller for calculating the value of the battery module voltage on the basis of an output voltage from the differential amplifier circuit,

wherein the controller performs:

detecting a variable effective gain of the differential amplifier circuit;

20 applying the battery module voltage to the input terminals of the differential amplifier circuit;

detecting the output voltage of the differential amplifier circuit that is applied with the battery module voltage; and

calculating the value of the battery module voltage by modifying the output voltage of the differential amplifier circuit on the basis of the effective gain.

25 2. The apparatus of claim 1, wherein the detecting of a variable effective gain comprises:

switching the first switching circuit OFF (SC1-OFF) and the second switching circuit ON (SC2-ON);

30 detecting an output voltage of the differential amplifier circuit in the state of SC1-OFF and SC2-ON; and

calculating the effective gain of the differential amplifier circuit on the basis of the detected output voltage.

3. The apparatus of claim 2, wherein the calculating of the effective gain calculates the effective gain as a value obtained by dividing the output voltage of the differential amplifier circuit by the reference voltage.

4. The apparatus of claim 1, wherein the applying of the battery module voltage switches the first switching circuit ON (SC1-ON) and the second switching circuit OFF (SC2-OFF).

5. The apparatus of claim 4, wherein:  
the first switching circuit comprises a capacitor, a first switch for controlling the connection between the capacitor and the battery module, and a second switch for controlling the connection between the capacitor and the input terminals; and  
the applying of the battery module voltage comprises:  
switching the first switch ON (SW1-ON) and the second switch OFF (SW2-OFF);  
waiting for a predetermined period in the state of SW1-ON and SW2-OFF; and  
switching the first switch OFF (SW1-OFF) and the second switch ON (SW2-ON).

6. The apparatus of claim 1, wherein the calculating of the value of the battery module voltage calculates the effective gain as a value obtained by multiplying the output voltage of the differential amplifier circuit by the effective gain.

7. The apparatus of claim 1, further comprising a power-key for controlling supplying of electric power to an electric load of the electric vehicle, wherein the controller detects the effective gain of the differential amplifier circuit at least when the power-key is turned on.

8. The apparatus of claim 1, further comprising a temperature detector for detecting a temperature of the differential amplifier circuit, wherein:

the controller further performs detecting the temperature of the differential amplifier circuit and comparing the detected temperature with a predetermined temperature; and

the detecting of the effective gain is performed at least when the detected temperature is above the predetermined temperature.

9. The apparatus of claim 1, wherein

the differential amplifier circuit comprises a differential amplifier;

the input terminals of the differential amplifier circuit comprises first and second input terminals;

the first and second input terminals of the differential amplifier circuit are connected to first and second terminals of the differential amplifier interposing first and second resistors, respectively;

an output terminal of the differential amplifier is connected to the first input terminal interposing a third resistor; and

the second input terminal of the differential amplifier is grounded interposing a fourth resistor.

10. A method for measuring a value of a battery module voltage using a differential amplifier circuit for outputting a modified voltage difference, the battery module being included in a modularized battery of an electric vehicle, the differential amplifier having input terminals and at least one resistor, the modified voltage difference being obtained by modifying a voltage difference inputted through the input terminals on the basis of a gain according to the resistivity of the at least one resistor, the method comprising:

detecting a variable effective gain of the differential amplifier circuit;

applying the battery module voltage to the input terminals of the differential amplifier circuit;

detecting the output voltage of the differential amplifier circuit that is applied

with the battery module voltage; and

calculating the value of the battery module voltage by modifying the output voltage of the differential amplifier circuit on the basis of the effective gain.

5            11.     The method of claim 10, wherein the detecting of the variable effective gain comprises:

applying the reference voltage to the input terminals of the differential amplifier circuit;

10           detecting an output voltage of the differential amplifier circuit while the reference voltage is applied; and

calculating the effective gain of the differential amplifier circuit on the basis of the detected output voltage.

15           12.     The method of claim 11, wherein the calculating of the effective gain calculates the effective gain as a value obtained by dividing the output voltage of the differential amplifier circuit by the reference voltage.

13.     The method of claim 10, wherein:

20           the applying of the battery module voltage includes using a capacitor, a first switch for controlling the connection between the capacitor and the battery module, and a second switch for controlling the connection between the capacitor and the input terminals; and

the applying of the battery module voltage comprises:

25           switching the first switch ON (SW1-ON) and the second switch OFF (SW2-OFF);

waiting for a predetermined period in the state of SW1-ON and SW2-OFF; and switching the first switch OFF (SW1-OFF) and the second switch ON (SW2-ON).

30           14.     The method of claim 10, wherein the calculating of the value of the battery module voltage calculates the effective gain as a value obtained by multiplying

the output voltage of the differential amplifier circuit by the effective gain.

15. The method of claim 10, further comprising determining if a power-key for controlling supplying of electric power to an electric load of the electric vehicle is turned on, wherein the controller detects the effective gain of the differential amplifier circuit at least when the power-key is turned on.

16. The method of claim 10, further comprising detecting the temperature of the differential amplifier circuit and comparing the detected temperature with a predetermined temperature, wherein the detecting of the variable effective gain is performed at least when the detected temperature is above the predetermined temperature.